Claims

1. A positive electrode material for a lithium-ion or lithium-ion polymer battery, having the formula

$$LiNi_XCo_YM_ZO_2 \cdot (LiOH)_k(Li_2CO_3)_m(LiHCO_3)_n$$

wherein M is one or more transition metals different than Ni and Co, $X+Y+Z=1$, $X \geq Y$, $Z<0.5$, $0.001<k+m+n<0.3$, and $k+n<0.1m$.

2. The positive electrode material of claim 1 wherein $k+n<0.01m$.

3. The positive electrode material of claim 1 wherein $k+n<0.001m$.

4. The positive electrode material of claim 1 wherein $Y=0$.

5. The positive electrode material of claim 4 wherein $k+n<0.01m$.

6. The positive electrode material of claim 4 wherein $k+n<0.001m$.

7. The positive electrode material of claim 1 prepared by exposing the positive electrode material at a temperature of 0-650°C to a CO_2-containing gas having a partial pressure of CO_2 in the range of 0.0001-100 atm to convert LiOH to Li_2CO_3.

8. The positive electrode material of claim 7 further prepared by heating the positive electrode material to a temperature of at least 250°C in the presence of an oxygen-containing gas having a partial pressure of O_2 in the range of 0.01-99 atm to convert $LiHCO_3$ to Li_2CO_3.

9. The positive electrode material of claim 1 prepared by heating the positive electrode material to a temperature of at least 250°C in the presence of an oxygen-containing gas having a partial pressure of O_2 in the range of 0.01-99 atm to convert $LiHCO_3$ to Li_2CO_3.

10. The positive electrode material of claim 1 prepared by heating the positive electrode material to a temperature of 250-500°C in the presence of an oxygen-containing gas having a partial pressure of O_2 in the range of 0.01-99 atm to convert $LiHCO_3$ to Li_2CO_3 and in the presence of a CO_2-containing gas having a partial pressure of CO_2 in the range of 0.0001-100 atm to convert LiOH to Li_2CO_3.

11. A lithium ion battery comprising a positive electrode material of the formula

$$LiNi_XCo_YM_ZO_2 \cdot (LiOH)_k(Li_2CO_3)_m(LiHCO_3)_n$$

wherein M is one or more transition metals different than Ni and Co, $X+Y+Z=1$, $X \geq Y$, $Z<0.5$, $0.001<k+m+n<0.3$, and $k+n<0.1m$.

12. The lithium ion battery of claim 11 wherein $k+n<0.01m$.

13. The lithium ion battery of claim 11 wherein $k+n<0.001m$.

14. The lithium ion battery of claim 11 wherein $Y=0$.

15. The lithium ion battery of claim 14 wherein $k+n<0.01m$.

16. The lithium ion battery of claim 14 wherein $k+n<0.001m$.

17. The lithium ion battery of claim 11 wherein the positive electrode material is prepared by exposing the positive electrode material at a temperature of 0-650°C to a CO_2-containing gas having a partial pressure of CO_2 in the range of 0.0001-100 atm to convert LiOH to Li_2CO_3.

18. The lithium ion battery of claim 17 wherein the positive electrode material is further prepared by heating the positive electrode material to a temperature of at least 250°C in the presence of an oxygen-containing gas having a partial pressure of O_2 in the range of 0.01-99 atm to convert $LiHCO_3$ to Li_2CO_3.

19. The lithium ion battery of claim 11 wherein the positive electrode material is prepared by heating the positive electrode material to a temperature of at least 250°C in the presence of an oxygen-containing gas having a partial pressure of O_2 in the range of 0.01-99 atm to convert $LiHCO_3$ to Li_2CO_3.

20. The lithium ion battery of claim 11 wherein the positive electrode material is prepared by heating the positive electrode material to a temperature of 250-500°C in the presence of an oxygen-containing gas having a partial pressure of O_2 in the range of 0.01-99 atm to convert $LiHCO_3$ to Li_2CO_3 and in the presence of a CO_2-containing gas having a partial pressure of CO_2 in the range of 0.0001-100 atm to convert LiOH to Li_2CO_3.